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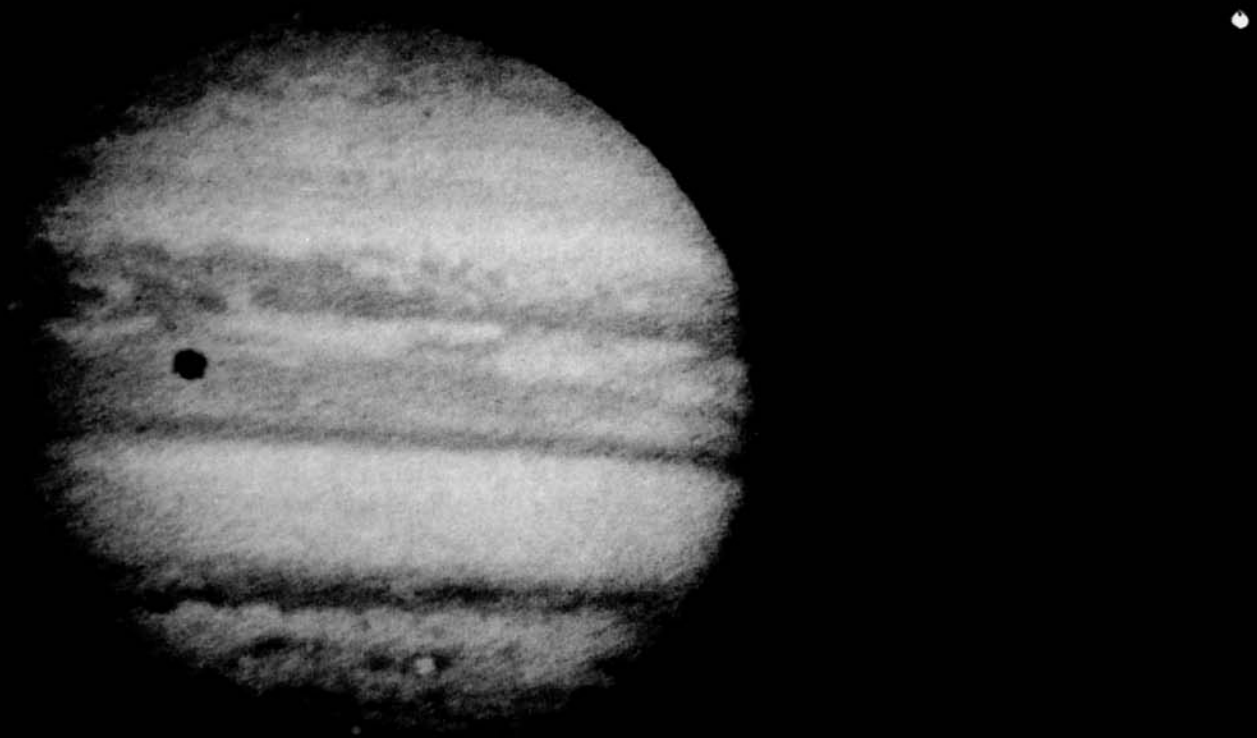

VIEW OF JUPITER AND ITS SATELLITE Io BY PIONEER 10

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HOUSE OK'S JOP

Washington, D.C.'s July weather isn't the only featureof the U.S. Capital that resembles a pressure cooker. Summer is also a season in which Congress puts the pressure on supporters of Federal programs to justify their funding requests.

Planetary scientists, elated at the unexpected inclusion of the Large Space Telescope in both the House and Senate NASA Appropriations Bills, were hopeful that the Jupiter Orbiter Probe (JOP) would also get the nod from Congress. JOP sailed through the Senate Commerce Committee and House Science and Technology committee, but the next step, approval by the House and Senate Appropriations Committees, looked less easy. Perennial NASA bogeyman Senator William Proxmire (D-Wis.) had made unfriendly noises about both the Large Space Telescope and JOP. But his committee allowed the two programs to stand, while, over in the House, supporters were caught off guard when Edward Boland (D-Mass.) nixed JOP.

Because the House and Senate versions of the NASA Appropriations Bill differed after Boland's JOP deletion, a joint Senate/House conference committee was formed to iron out their differences before reporting the bill to the floors of the two chambers for a vote. (A yes vote from Congress on such committee-approved funds is virtually automatic.) But this time the committee reached an impass. Boland refused to back down on JOP, asserting that "NASA always gets what it wants," while NASA's Office of Congressional Liason complained that "We've hardly ever had a project come off on time in the last several years because they cut back our money and we end up having to juggle things around."

Wednesday, July 13, the committee was hopelessly deadlocked. Near midnight, in a surprise move, Boland called for a vote of the full House on his JOP deletion move. The vote was scheduled a scant two days later: Friday, July 15.

JOP supporters were stunned. As a worried NASA official recalled, "I've been in Congressional Liason for at least 14 years, and a House Committee's recommendation on a NASA appropriation has *never* been overturned on the floor." And, as asteroid expert Clark Chapman was pointing out, "Only 35 or so out of the 435 members of the House have even heard of JOP."

It looked like the end of an era. Planetary flight mission funding had been declining precipitously for years. The demise of JOP would have meant that the early development team at the Jet Propulsion Laboratory in Pasadena, which lays the foundations of all planetary missions, would be disbanded.

Planetary scientists are normally an apolitical lot. In the past, their projects were quietly snuffed out in committee. But the completely unexpected opportunity to battle it out on the House floor goaded them into action.

"We've got to take it to the people-the folks who are standing in line to see Star Wars," declared San Diego scientist Jim Arnold. Thursday, with no more than 36 hours to go before the scheduled vote, the Division of Planetary Sciences of the American Astronomical Society sent telegrams to all planetary scientists.

Across the nation planetary scientists read their telegrams and grabbed the phone, calling the local news media and alerting friends. A long distance "telephone tree" was set up to reach as many people as possible. "If you call 7 people and tell them about JOP and get each of them to call another 7, and so on, we've got it made."

Telegrams and phone calls began arriving at Congress; by Friday the phone at NASA's office of Congressional Liason was ringing off the hook. "There were literally hundreds of House staffers calling," a NASA official reported. "They'd say, 'Hey, we've heard JOP is in trouble. What's JOP?'"

In the meantime, unexpectedly long House debates on other bills made it clear that the JOP vote would be delayed at least until Monday. Word flashed over the hastily organized phone network: "We've got a chance!"

Even so, time seemed hopelessly short. One Republican staffer who had first heard of JOP's problems around midnight Thursday complained, "After spending all day going around to other Representative's offices, when I went home Friday night I felt like beating my wife! Getting those people aware of what's happening to JOP is like trying to nail jello to the wall."

Monday morning Washington residents, as is their custom, read the Washington Post over breakfast. Inside they found an editorial supporting JOP. Over on Capital Hill, California governor Jerry Brown, Morris Udall (D-Arizona) and Carter Science Advisor Frank Press were using their not inconsiderable influence to woo Democratic votes for JOP. On the Republican side, Minority Leader John Rhodes and John Ashbrook (R-Ohio), among others, were also lining up votes for JOP. The political pros now were giving it a 50/50 chance.

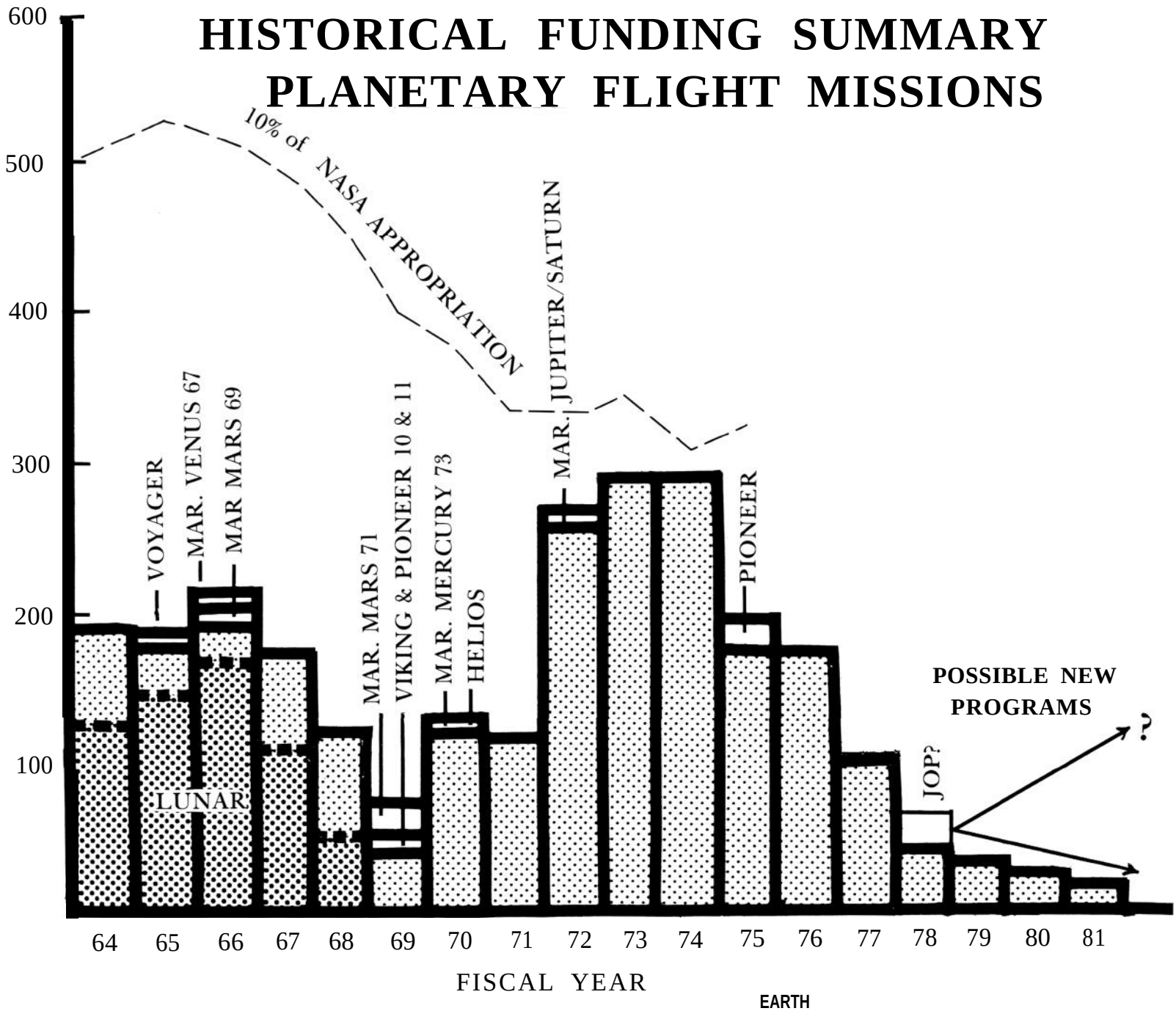
Tuesday, July 19, rolled in wet and hot. Inside the chamber of the House of Representatives the air conditioning was doing its job, but planetary scientists in the visitors' gallery were sweating. JOP, given a reprieve until now, was about to be voted on.

The hour of scheduled debate opened with Edward P. Boland. He held the floor for nearly half an hour, defending his committee's cut of JOP funds. Then JOP supporters got the floor. The first to speak was House Minority Leader John Rhodes (R-Arizona) (see related story). He was followed by Barbara Mikulski (D-Maryland), who wisecracked, "I hate to have to agree with the Minority Leader, but . . ." And one after another, some 30 Republicans and Democrates from all over the country got up behind the podium and defended JOP.

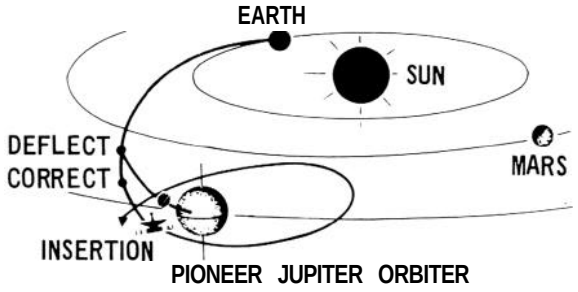
However, the real action was not on the floor, where only some 60 out of the 435 members of the House were present. JOP supporters were concerned about rumors that Speaker of the House and close Boland associate Tip O'Neill was out gathering votes to kill JOP.

(Continued page 4)

HISTORICAL FUNDING SUMMARY
PLANETARY FLIGHT MISSIONS



JUPITER PROBE
REFERENCE DESIGN MISSION



LAUNCH DATE: 21 **DEC 81**
ARRIVAL DATE: 24 NOV 84

Probe release from the bus occurs at 500 Jupiter radii from the planet in a plane slightly tilted to the equatorial plane. The targeted entry point is 3.15 degrees North latitude and 28 degrees before the evening terminator. Entry is at -7.5 degrees at 450 kilometers (km) above Jupiter's theoretical one bar pressure level and at a relative velocity of 47.4 kilometers per second. When the probe senses deceleration, it initiates warmup and prepares to start its scientific measurements. After a peak deceleration of about 300 g's, the deceleration level drops off, and at about -3g's the probe will be in a subsonic flight condition. Sensors are then deployed, data is formatted, and real-time and stored data are interleaved onto the RF telemetry link to the spacecraft bus. The telemetry carrier wave is used for acquisition purposes and to provide range rate data by Doppler techniques, and for reconstruction of an atmospheric model of Jupiter.

RHODES LEADS SUCCESSFUL EFFORT TO PRESERVE JOP

Congressman and House Minority Leader John J. Rhodes (R-Ariz.) spearheaded a successful effort in the House of Representatives to preserve funds for the Jupiter Orbiter Probe despite attempts to abolish the program. After debate during which both Republican and Democratic members spoke in favor of the probe, the House voted to appropriate money for the program.

An amendment to the National Aeronautics and Space Administration appropriations bill sought to delete funding for the Jupiter Orbiter Probe Program for Fiscal Year 1978. After debate during which Rhodes led efforts to strike down the amendment, it was defeated 280 to 131.

In remarks from the House Floor, Rhodes told his colleagues, "I believe that deletion of the funds for this program would seriously set back our balanced space efforts."

"The Jupiter Probe provides the first in-depth opportunity for exploration of the planet's atmosphere and is expected to advance our knowledge of atmospheric processes," Rhodes said. "I hope that my colleagues would want to take advantage of this opportunity to maintain U.S. leadership in space exploration."

"In addition, the program is a key link in maintaining our leadership in planetary exploration and dedication to expanding knowledge of the universe. As had been pointed out by other Members (of the House of Representatives), the program is now designed to take advantage of the optimum launch date in 1982. The next optimum launch time will not come until 1987, and any interim effort would require a greater launch energy."

"Any delay in the funding of the program would not only delay our space efforts but would cause the disruption of this highly coordinated effort and could result in the loss of very specialized personnel," Rhodes said.

House Minority Leader John Rhodes

House OK's JOP *(Continued from page 2)*

At the end of the speeches a voice vote was called. Those who backed Boland's JOP cut called out "aye." Then the "nay's" rang out, far louder. But Boland, expecting that the absent Representatives would back him, called for a quorum.

A buzzer rang throughout the buildings of the House of Representatives. In offices, hearing rooms, corridors and cafeterias, the Representatives got the message: fifteen minutes to get to the floor and vote. The rush was on.

Those already on the floor filed over to the forty voting terminals. One by one they inserted their plastic identification cards and pushed a button to indicate a yes or no vote. An electronic scoreboard then flashed his or her name and vote, and talleyed up the score.

As expected, the early count from those who had given the voice vote ran 2 to 1 against Boland's measure. But they were only a small fraction of the total. Then the rest of the Representatives began crowding in. Hundreds of them. In the gallery, the scientist's eyes were riveted on the scoreboard as the votes piled up. The 2 to 1 margin was holding-Tip O'Neill had decided to remain on the sidelines, and Boland was on his own.

The timer counted down to the end of the fifteen minutes. The vote was in: 280 opposed the JOP cut, and only 131 supported it.

In the gallery, the scientists were jubilant. Across the nation the phone network went into action once again, carrying congratulations to the citizens who had joined hands in the JOP rescue operation.

Asteroid expert Clark Chapman, on behalf of the planetary sciences community, extends thanks to L-5 members, who with their money and action helped to save JOP. -Carolyn Henson

SPS, SPACE INDUSTRY FUNDS CUT

July 13 a House-Senate conference committee finalized all NASA appropriations except for JOP (see lead story this issue.) The Large Space Telescope was awarded $36 million, and the cut in Shuttle funds made by Rep. Boland's subcommittee was restored, with the proviso that certain program milestones should be met.

However, several NASA requests were cut. Among them were a $5 million reduction for space industrialization studies and a $2 million cut in solar power satellite funds (hey, folks, that's us!) Also cut was $3 million for Viking follow-on studies. A $2 million ozone depletion study was dropped entirely.

FROSH STEPS UP TO NASA POST

Dr. Robert A. Frosch, 49, has become Administrator of the National Aeronautics and Space Administration. Frosch was Associate Director for Applied Oceanography at the Woods Hole Oceanographic Institution on Cape Cod, Mass.

Frosch succeeds Dr. James C. Fletcher, who resigned May 1, after six years service as NASA's Administrator.

From 1973 to 1975, Frosch was Assistant Executive Director of the United Nations Environment Programme, holding the rank of Assistant Secretary General of the United Nations. Previously, from 1966 to 1973, he was Assistant Secretary of the Navy for Research and Development.

Frosch's professional career began in 1951 with the Hudson Laboratories of Columbia University, where he worked on Naval research projects. There he progressed from Research Scientist to Director of the Laboratories, becoming Director in 1956 and remaining in that post until 1963.

Frosch, a native New Yorker, earned his A.B., A.M. and Ph.D. degrees at Columbia University. He is a member of Phi Beta Kappa and Sigma Xi. He received the Arthur S. Flemming Award in 1966 and the Navy Distinguished Public Service Award in 1969. Frosch is a member of some nine scientific professional societies and the author of numerous scientific publications.

Dr. Robert A. Frosh

IT'S EYES DOWNWARD

by Leonard Dauid

On June 23rd NASA's fifth Administrator in its 19 year history met the Washington press corps at what was billed as a "get-acquainted" news conference.

New NASA Administrator Dr. Robert Frosch, in his opening remarks, sprinkled holy water on a wide variety of current and future NASA activities, but underscored his discussions with the attitude of "getting the NASA house in order." Demonstrating a "first things first" attitude, Frosch emphasized the need to complete the development of the Shuttle and prepare a foundation for even more elaborate applications of our space capabilities.

It is clear that the new NASA Administrator has a keen eye on applications programs and in increasing public awareness of NASA's entire stable of application satellite concepts. But with this increased capability, Frosch strongly feels that management of those systems is paramount. "As the Shuttle comes into being, we are going to be doing things in the application direction that are going to be entirely new in the way we put together systems and manage them. I think that is going to take a considerable major new effort," stated Frosch.

When questioned about the space settlement concept, Frosch reacted. by saying "I want to understand better than I do now why we want to colonize space and what it is that will be gained by doing that. In any case, I don't think we will understand how to do it and why until we have some experience with routine use of the Shuttle."

Continuing Frosch emphasized that, in the case of space settlements, "we have just begun to get our imaginations and our thoughts fired up. In every major technological development that I know of." said Frosch, "the import uses were not the ones that you were able to think about in advance, but the ones that came upon you when you actually had the tools."

According to Frosch, even near term space station development looks a little far off. Frosch believes that the technology isn't at hand to build a large permanent space station, or "even a long-term colony with a lot of people. I have not seen any reasons that have convinced me that *now* is the time to make a major attempt to do such a thing. I don't know when the time will be to do that," observed Frosch.

However, Frosch considers NASA as the "logical" agency to develop the Solar Power Satellite concept, with the space agency engaging in small-scale experiments to test the feasibility of an SSPS system via the Shuttle.

Summing up, it appears that Dr. Frosch has taken up T.V. star Leonard Nimoy's (alias Dr. Spock) quest of "In Search of . . ."

You advocates of large space stations, SSPS, space settlements, and possible resumption of expeditions to the moon and planets, will have to wait. It's eyes downward, and more earth-assisting satellite applications. Luckily the Universe will be patient!

SPS DISTANT, SAYS FROSH

A satellite solar-power system "appears to be technologically feasible," but its development and use are "between 25 and 100 years" away. Robert A. Frosch told a Senate committee in June hearings to confirm his nomination as head of the National Aeronautics and Space Administration. Supposing thermal energy were collected by large space-based solar-cell arrays, "we have only the sketchiest ideas of the costs" of converting that energy into electricity and transmitting it to earth for distribution by microwaves or other means, Frosch said.

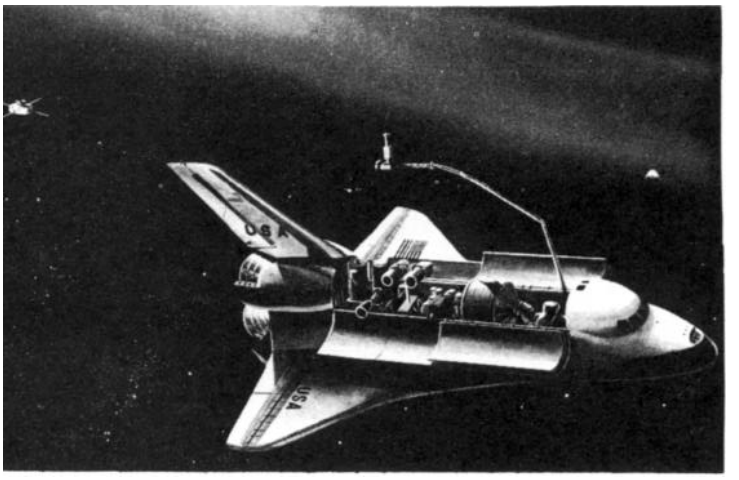
But NASA will get a better handle on satellite solar-power economics -- including the cost of erecting large space structures-when it begins using the Space Shuttle, Frosch believes. The transmission problem "will have to be attacked on its own merits," but only after "we have a better capability for the appropriate structures and experiments in space."

MILITARY SHUTTLE FLIGHTS PLANNED

When the space shuttle starts flying in 1979, the U.S. military will for the first time be in charge of piloted missions beyond the atmosphere. Current estimates are that one third of the projected 725 shuttle flights in the 80's will be under military sponsorship.

Plans are to use the shuttle for satellite deployment and repair. The military has also offered to develop a "space tug" for NASA which will boost payloads from the shuttle's 100-500 mile high orbit range to 20,000 miles and higher.

What do these plans mean for the space warfare debate? Mr. Currie, Director of Research and Development for the Department of Defense, says, "Over the next 10 or 15 years, space is not going to remain the unmolested territory, the sanctuary, that it is today. This issue must be addressed explicitly."



NEWS FROM ERDA

ERDA/NASA POWERSAT CONCORD

A series of meetings between NASA Deputy Administrator Alan Lovelace and acting ERDA Administrator Robert Fri has culminated in a joint NASA/ERDA solar power satellite (SPS) research program. The proposed SPS program calls for expenditures of a total of $19.5 million over the 4 years from 1977 through 1980.

It provides for an outlay in the current fiscal year (1977) of $2.5 million within NASA and $700,000 within ERDA. In fiscal year 1978 NASA is slated to spend $3.5 million and ERDA $2.6 million. This compares with the $4 million Congress has already approved for NASA SPS work in FY '78 and $3 million which is currently under consideration in a joint House/Senate conference committee for ERDA in FY '78.

The SPS energy program has been sent to energy czar Schlesinger where it awaits his approval and incorporation into Carter's energy plan. And while enthusiasts may complain that the SPS program is not yet a booming business, at least power satellites are gaining a place in the sun within the Carter administration.

ENERGY SOCIAL ISSUES STUDY

Researchers at Yale University will attempt to determine the social consequences of some of the Nation's key energy options under a new program funded by the Energy Research and Development Administration (ERDA).

The research will be carried out by Yale's Institution for Social and Policy Studies. It will involve a multi-disciplinary group of Yale faculty and ERDA scientists.

Professor Charles Walker and Dr. Leroy Could of the Institution will be in charge of the program. ERDA funding for the first year of the project is $155,000.

"There already has been a great deal of social science research done on certain types of energy development projects," said Dr. James A. Liver-man, ERDA's Assistant Administrator for Environment and Safety. "Unfortunately this research is duplicative and merely describes the problems. In this program, we intend to evaluate the existing social science research on energy so that our future efforts can provide more concrete approaches to solving some of the problems that have already been identified."

The team will examine the social consequences of energy options under development by ERDA, including such issues as employment, community growth, transportation, government regulation, and public participation in decision-making.

Initially, they will concentrate on the social consequences of increased use of coal and nuclear power, application of various conservation approaches, arid the use of solar energy.

The Yale team also will assist ERDA in identifying social science research issues which should receive increased attention in energy technology planning and development. This "Mapping Project on Energy and the Social Sciences" will also help ERDA to plan future social science research projects.

ERDA ISSUES NATIONAL ENERGY R & D PLAN

The Energy Research and Development Administration (ERDA) has issued its annual plan for research, development and demonstration efforts in support of the President's National Energy Plan.

Acting ERDA Administrator Robert W. Fri noted in a transmittal letter to Congress and the President that "the President's overall energy plan provides the neededcontext for the national energy RD&D effort and includes specific sections on energy RD&D."

Single copies may be obtained by writing to ERDA, Technical Information Center, P.O. Box 62, Oak Ridge, Tennessee 37830.

BOOK REVIEWS

Colonies in Space
by T.A. Heppenheimer, Stackpole, 1977. Reviewed by K. Eric Drexler for AIAA Student Journal and the L-5 News.

Colonies and the future of humanity in space make a complex topic. To do it justice is difficult, but Dr. Heppenheimer's book has succeeded quite well, combining background information, dreams, graphics, and engineering numbers with lively writing to produce a pleasing package.

Topics discussed include the solar system as a place for life, the history of the space colony idea, power satellites, the potential impact of colonies and power satellites in the next several decades, the space shuttle and advanced lift vehicles, lunar resources and their exploitation, the mass driver, establishment of early industrial facilities in orbit, specific space colony design ideas, agriculture in space, construction of colonies research and industry in space, the potential of the asteroid belt for human settlement, and the eventual prospects for interstellar expansion. Heppenheimer builds on the solid base of his background as an aerospace engineer, planetary scientist, and participant in the major conferences and studies dealing with space colonization.

The concept of colonies as an integral part of large scale industrial activities in space has become gradually more influential. The early visions of mammoth "new Earths" in 2050 have gradually gained roots which twine comfortably with Shuttle-era programs of the 1980's. The early justification of exporting population to ease pressure on Earth a half century from now has given way to the idea of using non-terrestrial resources as a short-cut to economical power satellite construction in the 1990's. Changes of concept and mission continue today, but the underlying theme of a beach-head in space using non-terrestrial resources remains, and appears to be gaining strength under scrutiny.

Portraying such a shifting topic presents problems. Deciding what audience to write for presents further problems. In "The High Frontier," one of the other recent books on this topic, Dr. O'Neill writes to an audience that is humanistic, skeptical, and needs to be convinced of the practicality and relevance of space. His book, therefore, is cautious in tone and is careful to build a strong case for "why" before attacking "what," "how," and "what next?" It deals with the changing topic by concentrating on what are hoped to be solid general concepts, rather than on details of scenarios and systems. In "Colonies in Space," Dr. Heppenheimer writes to an audience assumed to be receptive but not necessarily enthusiastic. His book, therefore supplies the "why" and the "how" as it goes along, without exercising itself to prove at the outset that space is relevant and that living in space is not science fiction.

"Colonies in space" shows an unusual concern for both entertaining and informing the reader. The writing is clear and lively, sometimes crossing the line from exposition to drama. Ideas are not presented as results of science, but as results of individual's work and of earlier ideas. Background material (which pulls its own weight in reader interest) appears throughout the book. This ranges from a capsule description of the solar system (rather than simply alluding to "asteroids," etc. with which some readers will be unfamiliar) to a history of the political and economic factors that led to today's Space Shuttle.

As a book to lend a friend, "Colonies in Space" is an eye-catcher. Most pages are broken by diagrams, illustrations, photographs, or paintings (some reproduced in color). It is the sort of book whose title gets it picked up off the coffee table, whose graphics and layout earn it an interested thumbing-through, and whose text gets it read.